Light and Lighting

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Contents

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Standardization

WITH justifiable pride, the British Standards Institution has recently been celebrating its Golden Jubilee. More than fifty industries collaborate with the Institution in its important work of promulgating British Standard methods of test, terms, definitions, codes of practice and specifications for a great variety of materials and articles. Each industry has its own Standards Committee and, of these Committees, the second largest is the Illumination Industry Standards Committee. These main Committees—which appoint representatives to Divisional Councils which, in turn, are represented on the General Council of the Institution—have numerous Sub-Committees undertaking the drafting of specific standards. Many Standards applicable to equipment required for the various fields of lighting have already been agreed and issued, and the Institution also publishes such Codes of Lighting Practice as have, so far, been prepared by the Council for Codes of Practice, as well as a Standard Glossary of illumination terms. This is good and very necessary work, and the principles underlying it are, that all British Standards shall be in accordance with the needs of industry and fulfil a generally recognized want; that the interest of both producer and consumer shall be considered; and that all Standards shall be periodically reviewed. We congratulate the Institution on its achievements and wish it well for the future.

Notes and News

Commission Internationale de l'Eclairage

Lighting engineers from Great Britain were well in evidence at the recent meeting of the Commission Internationale de l'Eclairage in Stockholm. The British delegation, the largest from overseas, was well organised and was prominent in the discussions of the various technical committees.

The arrangements for the meeting were in the hands of the Swedish National Illumination Committee under the chairmanship of Ivar Folcker. The committee must have worked extremely hard; the organisation was as near perfect as it could be for such a gathering where 22 nations were represented, and Mr. Folcker and his colleagues are to be congratulated on the results of their efforts. The meetings were held at the Royal Technical Institute, where the most excellent facilities were placed at the disposal of the Commission.

The technical programme was a very heavy one but time was found to include a number of most enjoyable social functions and visits with special arrangements for the entertainment of the ladies whilst their husbands were hard at work.

These excursions to other countries are, no doubt, too infrequent for some of us, who will accordingly regret that the next meeting will be in four years' time instead of the usual three. It is understandable that in off-duty hours delegates should make the most of the facilities, some new and others almost forgotten by delegates from this country, offered by the host country. The joys (and mysteries) of a Swedish menu, the first encounter with a smorgasbord, a meal in itself intended to whet one's appetite whilst waiting for the main dish, the impatience at first of strangely having to wait for the latter to be cooked and the ecstasy when the succulent steak is eventually served. Those of us who have only visited Stockholm this once will remember it as a city of good food, bicycles, no night and, to get almost technical for a moment, a city of lights reflected on the water. We shall also remember for a long time the kind people we met there. If we have emphasised the gastronomic appeal—well, one can't help noticing the difference.

A full report of the meeting will be given in our next issue but, in the meantime, we are sure all readers will join with us in congratulating Dr. Ward Harrison on being elected the new President of the Commission.

In addition to the secretariat reports over 40 papers were presented. The proceedings of the meeting will be published in three volumes, the secretariat reports, the papers and the accounts of the meetings including the discussions. The first two volumes will be available shortly and the third will probably be ready within a few months. The price per volume will be about 35/- and copies may be obtained through the National Illumination Committee.

Light Fittings Competition

The Royal Society of Arts' annual Industrial Art Bursaries Competition will this year include a section for the design of electric light fittings.

The primary purpose of the competition is to allow successful candidates to broaden their knowledge and experience by travel abroad and the study of foreign design, or, in certain cases, to obtain art

training or industrial experience in this country. A bursary of £150 in value is offered to the winning candidate.

The competition is open to full-time, part-time and evening-class students between the ages of 17 and 30 on September 1, 1951, who intend to take up industrial design as a career, and who have studied for not less than one term since September 1, 1950, at an art, architectural, technical or other college or school approved by the Society for the purpose of the competition.

Copies of the detailed particulars of the competition and entry forms can be obtained from the secretary of the Royal Society of Arts. The closing date for the receipt of entry forms is October 15, 1951.

The organisers hope that these annual competitions, besides benefiting the winning candidates individually, will serve a broader purpose by encouraging an increasing number of students to turn their attention to designing for industry.

South Bank Lighting Exhibit

The story of lighting at the South Bank Exhibition is told by exhibits and demonstrations in the Pavilion of Power and Production. In the small space allotted there isn't sufficient room to tell the story in detail, so the displays merely touch on the highlights and give some examples of modern achievements.

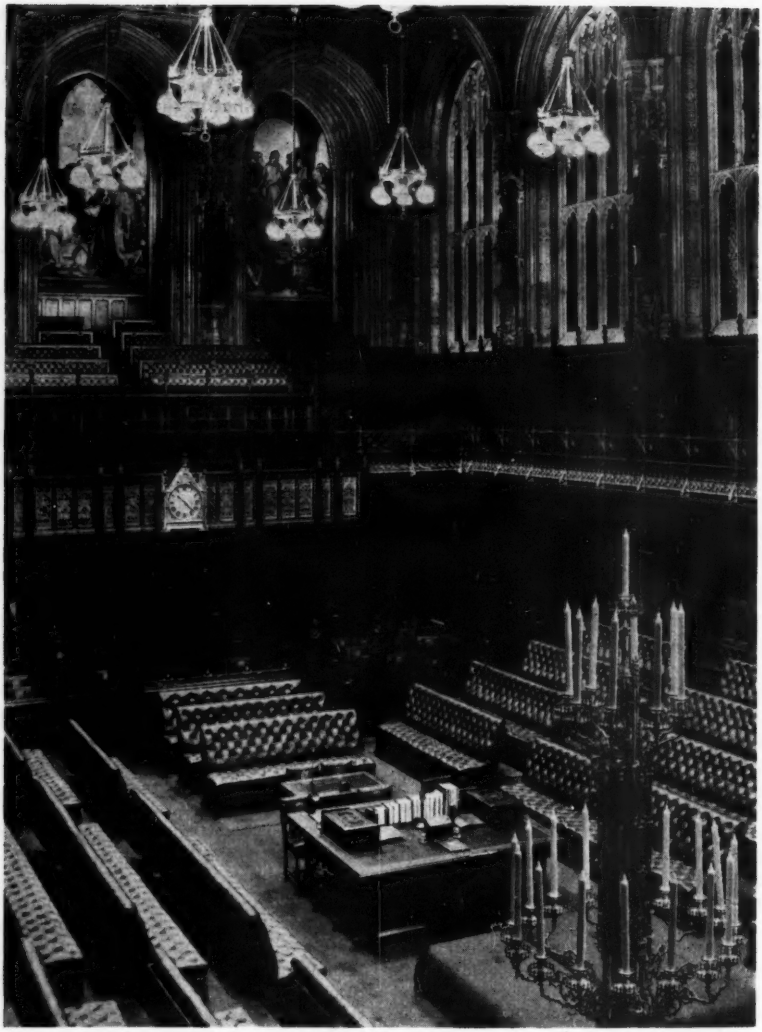
The exhibit is divided into several sections, each concerned with a different aspect of lighting. The first section is historical. The second section tells the story of the development of light sources in three wall cabinets. The first of these is concerned with the incandescent lamp and shows the increase in efficiency obtained by successive improvements in lamp design and construction, the steps in the process of manufacturing filaments from powdered tungsten, and the increase in brightness obtained by coiling the filament in a gas-filled lamp. It also contains examples of several incandescent lamps developed for specialised uses.

Discharge lamps are dealt with in the second cabinet, in which sodium, mercury vapour and blended tungsten-mercury vapour lamps are displayed in operation. Also displayed are examples of the new Zenon gas-arc, the 2½-kw. high-bay and compact source mercury vapour lamps. The last cabinet in the section is devoted to the fluorescent lamp. The display shows the development of the low-pressure A.C. mercury vapour discharge by means of discharge tubes operated in sequence by a push-button, and illustrates the production of fluorescence in various colours from different substances by means of a Becquerel lamp. A phosphor-coated rotating cylinder and a number of dishes containing phosphors set on a rotating turntable are irradiated by short-wave ultra-violet energy for part of a revolution to emphasise the relation between the presence of this radiation and fluorescence. This display is completed by the exhibition of six coloured fluorescent lamps.

In the outer corner of the hall, which is "L" shaped, there is a turntable fitted with an illuminometer which demonstrates the increase of visibility with increases in illumination. Also in the corner is an isolated stand displaying the operation of the gas-discharge flash tube and its apparent ability to stop motion, a flashing beacon, a 10-kw. lighthouse-lamp, a 100-watt G.L.S. lamp, and a sextant lamp of about the same size as a grain of wheat.

The remaining two wall display sections consist of eight modern incandescent lighting fittings operated in turn to show their respective light distributions, and a number of transparences of typical modern installations in streets, factories, homes and canteens. The story is completed by a ceiling on which designs in fluorescent paints glow under the stimulation of the familiar black-light lamps.

Those responsible for the design and presentation of this section are to be congratulated on having achieved such an interesting and comprehensive display of lighting achievements and developments in so limited a space.



View of the Chamber of the House of Lords looking towards the Press Gallery.

Reinstatement of the House of Lords

The refurbishing of the House of Lords has aroused much interest and the following article describes some of the work carried out in connection with the lighting arrangements

The House of Lords, rebuilt as part of the Palace of Westminster after the fire of 1834, was struck by a bomb one night in May, 1941, when the House of Commons was destroyed. The bomb went through the roof to the vaults below, fortunately without exploding. Extensive damage was done by blast in other raids during 1941 and the original stained glass windows were destroyed, and woodwork, doors and other delicate tracery damaged. From May to June, 1941, Lords and Commons met in Church House while the House of Lords was being temporarily repaired for use by the Commons. Since then until the new House of Commons was opened, the Lords have met almost continuously in the King's Robing Room.

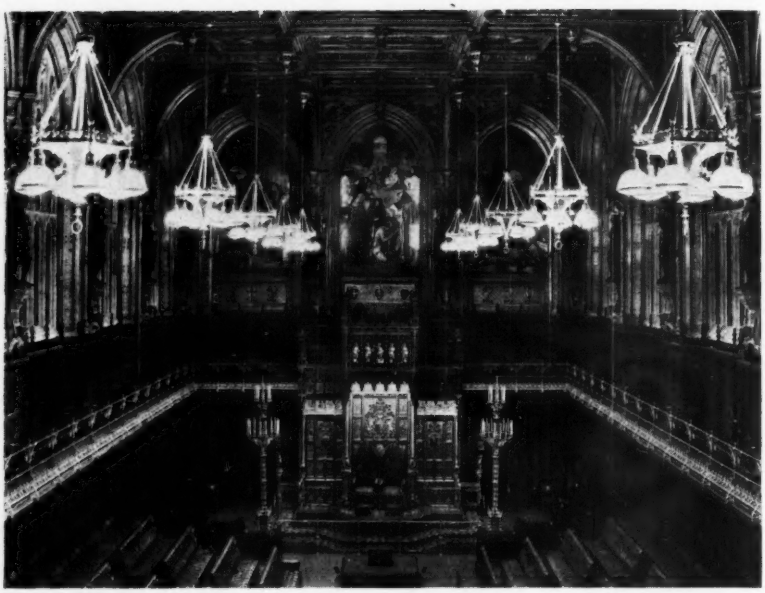
Towards the end of 1950 a sub-committee was appointed to consider matters relative to cleaning, renovation and seating in the Lords' Chamber after its vacation by the House of Commons. Among other recommendations was the suggestion that the lighting arrangements be improved.

As is generally known, the Lords desired as little alteration as possible to the general character of the Chamber, and particular emphasis was laid on the necessity for retaining the original lighting fittings. Designed by that short-lived genius Augustus Welby Northmore Pugin in 1836-7, these are really remarkable specimens of the metalworker's craft and so perfectly in keeping with the general architectural pattern that it is small wonder their lordships refused to contemplate their replacement by fittings of modern design, however distinguished. Raising the efficiency of the existing fittings without destroying their character was the problem facing the Ministry of Works, and as will be seen from the illustrations the results achieved were very successful, although they give little indication of the tremendous amount of experiment necessary before the simple and successful solution emerged.

Originally designed for gas lighting, Pugin's fittings had been modified to support clusters of bare lamps; each of the six points of the fittings in the Chamber supporting five 40-watt bulbs. Each of these clusters in the present modification was removed and replaced by a single 150-watt lamp accommodated in a standard enclosed prismatic reflector. This modification, as well as greatly improving the appearance, gave an average illumination intensity of 9 lm./ft.^{2} on the working plane, as against 1.5 lm/ft.^{2} with the previous arrangement, while the consumption per fitting was actually reduced from 1,200 watts to 900 watts.

A further modification which gave an enormous improvement to the general lighting scheme, without essential alterations to the character of the fittings, was the addition of indirect lighting. A trumpet or flower-shaped brass unit has been skilfully added inside the body of the fitting, its mouth pointing upwards and the incorporated lamps casting a brilliant illumination upon the magnificent painted ceiling which, hitherto, has been little but a dark background to the cluster of bare bulbs.

The lighting of three large frescoes in recesses at each end of the Chamber also presented something of a problem, particularly those at the Throne end, since the recesses there are considerably shallower and the available " throw " is very short. External floodlights were, of course, out of the question and the difficulty of obtaining even illumination on a large expanse by edge-lighting hardly needs emphasising. The problem was ultimately solved by the Ministry of Works engineers. Tubular tungsten lamps, enclosed in special reflectors, are



(Above) General view showing the lighting fittings in the Chamber.

employed concealed in the side mouldings and these tend to suppress light in the zone nearest to the fitting. The fittings each illuminate the further side of the picture, having beams that overlap. The peak intensity falls across the picture at two thirds of its width and this gives a very even illumination, free from specular reflection when viewed from any point in the Chamber.

Pugin's magnificent 12-light fittings in the Lords' Lobby and the Princes' Chamber have been modified in a similar manner to those in the main Chamber and it is now possible to appreciate fully the beauty of the ceilings in both apartments. In the Division Lobbies, the original gas fittings have been replaced by completely new six-light fittings by the Escare Art Metal Co., Ltd., to Ministry of Works design. The entire lighting for the House is controlled from one central control-room external to the Chamber. The control panel, built by Messrs. Micklewright, Ltd., incorporates two motor-driven dimmers, one for indirect lighting and the frescoes and the other for the general lighting. The panel includes light-meters to enable the operator to judge the illumination of the House. The wiring installation was carried out by Messrs. Troughton and Young and translucent lighting equipment was supplied by Holophane Ltd.

(Below) Type of fitting used in the Princes' Chamber.

Electric Lamps— A Decade of Progress

This article is the first of a short series designed to review the development of lighting with special regard to the contributions made by British scientists.

By J. N. ALDINGTON,
B.Sc., Ph.D., F.R.I.C., F.Inst.P.,
A.M.I.E.E., F.I.E.S.*

There have been many misinterpretations of the meaning and purpose of the Festival of Britain. Whatever else is intended it does, however, seem certain that at this time the British people should pause a moment to look at the broad picture of their achievements in the varied fields of science, technology, and industrial design.

A visit to the South Bank Exhibition will teach us how innumerable are the facets through which one can glimpse the progress that has been made or the diversity of contributions which together comprise the whole story of British achievement. It is, therefore, not inappropriate that we should use the occasion of the Festival to record some aspects of light source developments to which British scientists have contributed in some measure, either great or small.

Development of the tiny lamps which enable the surgeon to examine deep into the human body or of the powerful sources which produce the lighthouse beam has not occurred by chance, but is the result of years of patient work. To trace the history of even a single development in the ever progressing field of lamp research would require more space than can be allotted to the present article—to do it justice would require a book. It is, therefore, intended to indicate only the broad lines along which progress has been made and success achieved in the constant search for new and better sources of light. This search stems and flows from the desire to render ever more efficient the process of conversion of electrical energy into light.

In surveying the course of development over the last decade and the remarkable progress which has been made in certain fields we can trace the influence of both pure and applied research. We can see how from time to time advantage has been taken of the general advance of knowledge to divert the course of an investigation and to enable a forward step to be made. We can see, too, how investigations into the properties of transparent materials such as glass and quartz, refractory metals such as molybdenum and tungsten, and the rare gases such as krypton and xenon have contributed to the evolutionary progress from which have emerged the many different forms of electric lamp upon which the industrial, domestic, and social life of our country so much depends.

Perhaps the most elementary way of transforming electrical energy into light is to make use of the heating effect of an electric current as it passes through a metallic conductor. This is the basis of the incandescent tungsten filament lamp. While it is true that there are several thousand different forms of tungsten filament lamp, common to them all are certain features such as the filament itself, which is always made from the element tungsten, the filament supports, which are practically always made from thin molybdenum wire, and the various types of glass used for the internal construction of the lamp and for its outer envelope. Nowadays most lamps, after exhaustion, are filled with an inert gas, that is to say, with a gas which does not chemically react with tungsten even at the high temperature at which the filament is caused to operate.

It is true that no major development in the field of incandescent tungsten filament

*Director of Research, Siemens Electric Lamps and Supplies, Ltd.

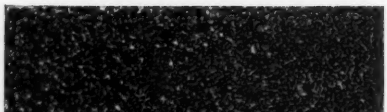


Fig. 1. Close-up of etched pits on the inner surface of a pearl lamp.

lamps has occurred during the past 10 years. It must not be assumed, however, that there has not been most active development and research into many aspects of lamp design and manufacture.

Miner's Lamp Bulbs

Noteworthy contributions have been made by British lamp designers to the present range of miner's lamp bulbs. Two main types of portable lamp are used by the coal-miner, both of which require special highly efficient electric lamp bulbs. In the so-called cap lamp the bulb is mounted in a headpiece worn on the miner's cap, and in the result a beam of light is produced directly in front of the miner and illuminates his particular working area. The miner's hand lamp, on the other nand, gives an all-round flood of light for general purposes. Both of these lamp bulbs are powered by a small portable battery, which may be either of the lead-acid or nickel-alkaline type. Obviously any improvement which enables the production of more light for a given consumption of power from the portable battery would be a step forward of major importance.

A notable advance in this direction was made by the large-scale introduction of krypton-filled miners' bulbs developed in the lamp research laboratories of this country. Approximately 20 per cent. more light is produced from a krypton-filled bulb than from the earlier argon-filled types. The development was made prior to 1939, but the war hindered progress, although many krypton bulbs were in use when war broke out. Since hostilities ended, however, new types of krypton-filled bulbs have been developed and a substantial contribution has been made to assisting the miner in his difficult task.

To bring about this result industrial plant had to be developed to extract krypton from the atmosphere in which it is present to the extent of only five parts in 1,000,000, and new techniques of lamp manufacture had to be evolved to enable the employment of smaller lamp bulbs and brighter filaments. It is tempting to digress and write of the work on air liquefaction and fractional distillation which enabled adequate quantities of krypton to be made available for this purpose, but this is a subject beyond the scope of the present article.

Silica-coated Lamps

When the gasfilled lamp was first developed it was soon appreciated that particularly for lighting purposes in which the lamp was required to operate within the field of view of the observer means should be sought to reduce the brightness of the source without of course reducing the luminous output. It is not possible to achieve this result in entirety, but the introduction of the pearl or inside-frosted lamp some 20 years or so ago was a material contribution to this end. Recently a further step forward of considerable importance has been effected by the development of lamps in which a very high degree of diffusion was obtained with low light absorption by the deposit of finely divided silica on to the inner surface of the lamp bulb.

It is an obvious truism that the required degree of diffusion to make the lamp bulb the virtual light source instead of the filament within the bulb could be obtained by coating the bulb with a white material. It is a matter of considerable difficulty, however, to produce and apply a white material in such a way that virtually the whole of the luminous output of the filament is emitted from the bulb surface. In the case of the pearl lamp, which provided a partial solution to this problem, etched pits were produced on the inner surface of the bulb by special chemical processes and these pits were shaped to be of lenticular form as shown in Fig. 1. The degree of light scattering was, however, governed by the average size of the pits. This grain size was itself related both to the chemical composition of the glass bulb and to the nature and composition of the chemical fluids used to roughen the surface. To achieve a higher degree of diffusion it was obviously necessary to employ an entirely different technique.

In the silica coated lamps which are now available use is made of a technique which

allows of the deposit on the inner surface of the lamp bulb, prior to lamp manufacture, of a fume of chemically produced extremely finely divided silica. The high degree of transparency of the individual particles, notwithstanding their extremely small size, allows of at least 95 per cent. of the light emitted from the filament to pass through the bulb which then glows evenly and becomes the virtual light source. It is interesting to record that this development, like that of the pearl lamp, has been made effective in most of the countries producing incandescent tungsten filament lamps while a great deal of the pioneer work originated from our American cousins.

Projection Lamps

In the field of projection lamps increased attention has been paid to the more accurate control of the emitted light by the optical system for which it is designed. An illustration of this is the British pre-focus headlamp. A number of different types of these headlamp bulbs are now available, but they have the common feature that the filament of each bulb is accurately pre-focussed in relation to the lamp cap. The lamp cap carries a disc which locks into a seating on the headlamp of the car thereby ensuring automatically the correct relationship of the lamp filament to the reflector system. This development is an undoubted contribution to road safety as the light from the car headlamp is directed at the proper angle and with the correct beam candle power on to the road surface.

Discharge Lamps

It is appropriate at this point to pay tribute to the co-operation which exists in this as in many other branches of human endeavour and to the way in which as a result of that co-operation when an advance is made its benefits are rapidly disseminated in every country. Nowhere has this been more true than in the development of the various forms of electric discharge lamp, with which may be included the low and high pressure mercury vapour lamps, the sodium lamp, rare gas discharge lamps of various forms and the fluorescent lamp.

In this connection it surely of interest to remember that the first electric discharge

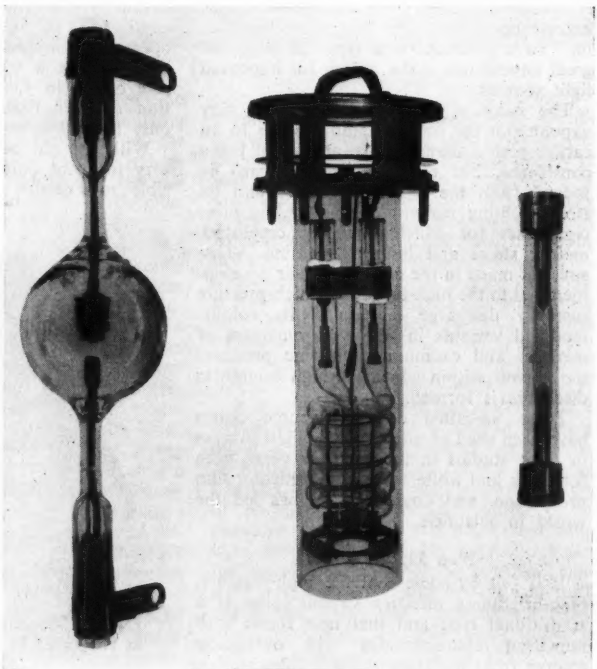


Fig. 2. Comparison of a 10-kw. high-pressure mercury compact source lamp with a 5-w. water-cooled gas arc and a xenon-filled flash tube.

arc was produced by Davy at the Royal Institution when he touched together two pieces of charcoal connected to a powerful battery. Davy's own notes read as follows:

"The charcoal became ignited to whiteness and by withdrawing the points from each other a constant discharge took place through the heated air, in a space at least equal to four inches, producing a most brilliant ascending arch of light, broad and conical in form in the middle."

Modern forms of the carbon arc still find important uses both in war and peace. They are still the principal light sources employed for motion-picture production and projection, but it is as the forerunner of the electric discharge lamp with which we are primarily concerned with the arc in this review.

Parallel with developments in other light sources, investigations into the properties of glow and arc discharges through various gases and metallic vapours are still being vigorously pursued. To-day in Great Britain alone there are several major groups of research workers continuously engaged in the study of electric discharge phenomena. Their discoveries have not only enriched contemporary science and furthered man's knowledge of the structure of matter, but they have produced new types of lamps of great importance in the search for improved light sources.

The story of the high-pressure mercury vapour and the sodium lamp belongs to an earlier period than the one at present being considered, but their importance can be judged from the effect they have had on street lighting techniques and by the principal uses for which they are employed, mainly street and highway lighting. Discoveries made in the course of their development led to the high-brightness, high-pressure mercury discharge lamp and its colour-modified variants in which an amalgam of mercury and cadmium with zinc produces the vapour within which the high brightness discharge is formed.

These so-called compact source lamps have been used as photographic light sources in films studios in the last few years both for black and white and for Technicolor film production, and Great Britain has led the world in this field.

New Light Sources

It is felt by some that the high-pressure, high-brightness mercury vapour lamp is a transitional type and that new forms with improved characteristics will eventually emerge from the lamp research laboratories. It is too early to say whether this prediction will prove true, but it is not too early to record that the investigations which led to the achievement of this type of lamp with its pure quartz envelope and its high-current direct metallic seals through quartz has opened up the way to several new and interesting types of light source.

In Fig. 2 a 10-kw. high-pressure mercury compact source lamp is shown compared with a 5-kw. water-cooled gas arc and a xenon-filled flash-tube capable of dissipating 16 kw. seconds in a single flash. In the development of these rare gas lamps use was made of the earlier pioneer work on high-pressure metallic discharges and particularly the high-current hermetic seals through quartz.

Of the two the xenon flash tube was historically the earliest. It was brought to fruition as a high-power light source during the war years for military purposes, and has since been produced in a variety of forms for commercial and industrial use. A particularly interesting form is that shown in Fig. 3 in which the flash tube proper, consisting of a quartz tube fitted with special electrodes, is mounted at the focus of an internally mirrored glass bulb of parabolic contour. This tube has been designed to operate in conjunction with apparatus which will produce a sequence of flashes at the rate of up to 4,000 per second, the duration of each flash being of the order of only five millionths of a second.

With the aid of this powerful investigatory tool not only has it been found possible to examine photographically rapidly

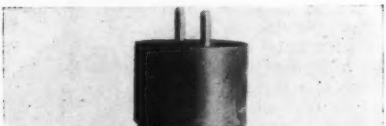


Fig. 3. Showing a flash tube mounted at the focus of an internally mirrored glass bulb.

Fig. 4. Example of high-speed photography by use of the Schlieren technique, showing convection currents rising from the warmth of the hand.

occurring events such as the cavitation phenomena exhibited by high-speed moving parts in water, but such phenomena as the convection currents rising in the atmosphere from the warmth of the hand can be portrayed by the use of Schlieren techniques. (See Fig. 4.)

The continuously burning xenon arc has been investigated by workers on the continent of Europe, in America, and in this country. The British contributions have included the provision of practical light sources such as the 5-kw. water-cooled gas arc, a 1,000-watt air-cooled xenon arc, and experimentally a number of high brightness types. It has been found that under certain conditions the high current density discharge through xenon can result in a source giving white light of daylight quality and at the relatively high efficiency of 25 to 35 lm/w. Valuable properties of all these xenon lamps are their ability to give full light output immediately the arc is ignited, and the fact that visible light has a spectral distribution not dissimilar from that of daylight.

The xenon arc is also a powerful source of infra red radiation as well as a valuable radiator of a continuous spectrum in the ultra violet region. It is as yet too early to predict what further forms of rare gas discharge lamp will eventually emerge, but there can be no doubt that British lamp research engineers are in the forefront of developments in this field.

The position with regard to fluorescent lamp developments is perhaps a little more definite. From the engineering aspect the fluorescent lamp is a well defined entity and is now available in a range of sizes which cover virtually every lighting need for which its properties make it suitable.

Fluorescent Lamps

It is difficult to overestimate the value of British contributions in a field in which so much is owed to the pioneer contributions of British scientists. One of the most outstanding aspects, however, is probably that of phosphor development. Many of the phosphors used in the first fluorescent lamps were the products of British research and the calcium halo-phosphate powders which were developed in Great Britain and introduced into fluorescent lamps some three or four years ago are now being used by

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Lighting the Way

By A. B. READ, R.D.I.*

The author of this article, one of our leading fittings designers, makes some very frank comments on present-day interior lighting design.

In spite of the great interest in lighting one rarely sees a lighting installation that is entirely satisfactory both from the standpoint of adequate illumination and from that of aesthetic unity and completeness. Whether we like to admit it or not, electric lighting in buildings is very often disappointing, and although so much is known of the theory and practice of illumination, for one reason or another the ultimate results are often disappointing to everyone; to the illuminating engineer because of inefficiency or inadequacy; to the architect because of failure to satisfy all his design requirements; and to the client because he finds it difficult to visualise what he has approved from drawings, and is therefore always surprised by what he gets.

Each interested party will feel another is responsible for the faults of a lighting scheme, but on completion of a building and its lighting installation, it is too late to make changes without great inconvenience, difficulty and cost.

There are many reasons for this failure to provide good contemporary interior lighting which fulfils all the requirements, and here are some of these contributing factors—not in any related order either of sequence or of importance: (1) An antiquated, wasteful and unsatisfactory system of tendering. (2) Inadequate provisional sums allowed for lighting fittings. (3) Distrust by the architect of the design appreciation, as distinct from the technical capabilities, of the electrical consultant. (4) The failure of the electrical industry to encourage progressive design of lighting fittings to keep abreast of technical lighting developments and with contemporary trends of design in allied industries. There is no room here to enlarge on these reasons, but each has contributed to the low standard of lighting design in this country. There are exceptions to this state of affairs, but it must be admitted that in most large towns or cities one would have to search long, diligently and often unsuccessfully to find shops displaying and selling ranges of decent, contemporary lighting fittings. In many towns and cities it would be difficult to find one public building—restaurant, library, cinema, council office or town hall—where lighting was of a really high standard.

The electrical trade has for many years past, both before and after the war, offered either reproduction period fittings or fittings clumsily following a vulgar interpretation of "modern" trends. These are the fittings displayed in most electrical shops and shown in many electrical catalogues, and an assessment of these leaves one in no doubt that the lighting fittings industry is a long way behind others in contemporary design.

It is difficult to understand this comparatively low standard of design in a medium that has such interesting and delightful possibilities. It is not only a low standard of shape and composition in individual lighting units, but an unimaginative use of electrical illumination generally. There is no doubt about the need for interesting lighting, and it therefore becomes more remarkable why so many interiors are spoiled visually by inappropriate lighting fittings or unsuitable means of illumination. The use of the fluorescent lamp has temporarily made the practice of lighting even more difficult. Its long lines are not easily introduced into rooms without cutting across existing ceiling decoration, or without giving strong directional qualities that are not wanted. Like lines of spaghetti these tubes have been spread indiscriminately over ceilings in old buildings and new without any thought of

*Director of Design, Troughton and Young (Lighting), Ltd.

decent manners or of respect for their settings.

Important lighting fittings manufacturers must be prepared to employ designers with a broad aesthetic art training in order to bring about a healthy collaboration between the design side—dealing with visual form—and the scientific side, which takes care of technical requirements and current media of illumination. That old-established models sell well is no reason for neglect of research and experiment in a progressive way. Only by tackling the problem of fittings design in this way can the products of this great industry be saved from remaining prosaic and dull. In all other industries—textiles, pottery, furniture and many more—the experimental design studio is an accepted and necessary unit in most manufacturing firms. The high standard of these British products and their sales at home and abroad are due to this constant design research behind the scenes. At present in the electrical industry manufacturers seem often well behind informed or even general public taste, and instead of anticipating future needs the manufacturer is reluctantly compelled by demand to change his products. Full order books due to world shortages or protection from competition tend to lull manufacturers into a false sense of well being. In free markets our prices cannot be competitive, and therefore our products must have a design interest and quality that justifies a higher price. This design value cannot be acquired overnight, but must be built up as an integral part of a firm's policy. Hence the need for the small research unit experimenting with new design needs and trends, and with new or little used materials as those in normal use become more difficult to obtain. Designs for lighting fittings can be broadly divided into those for (a) industrial or purely utilitarian use; (b) domestic and commercial use; (c) special purposes, including fittings for large public buildings. In the industrial and utilitarian sphere the design standard is a reasonable one, due to purposeful design uninfluenced by decorative considerations.

In the domestic field fittings are mostly reminiscent of traditional styles or are "modernistic." There is a dearth of simple, gay fittings, with a contemporary feeling in sympathy with the best contemporary furniture and interior design. For commercial purposes a reasonable variety of lighting fittings, both tungsten and fluorescent, is available. For large public buildings special fittings of all types, ranging from fully louvred ceilings to reproduction candelabra, have been used. For many buildings there is great scope for pendant and wall fittings less monumental and solid in form than those so often used. Lighter, gayer fittings open in construction and deriving their interest from graceful arrangement and logical but stimulating construction, would be eminently suitable and would recreate in a contemporary way the beauty and elegance that passed away at the end of the eighteenth century. With material shortages and restrictions, this design problem has created an urgent need for greater ingenuity and imagination in visualising the useful and decorative uses of little-known or little-used materials, both old and new. In some respects these difficulties may help the progress of sound design just as shortages and rigid standards resulted finally in the production of well-designed furniture in the utility ranges.

Electric lighting is the means of bringing to life all interiors, and the mere production of light in itself is belittling the possibilities of this wonderful medium. Infinitely variable in quality, colour and intensity, it is capable of providing that touch of enchantment and romance that most interiors need. We must hope that these wonderful possibilities will be appreciated and developed by lighting designers and consultants, and that graceful line and form will replace much of the present garishness and heaviness. What is needed is a lighter, gayer touch, and it is appropriate that this Festival Year should have seen its introduction.

The many exciting forms of lighting of interiors and displays in the South Bank Exhibition and other exhibitions connected with the Festival of Britain will no doubt have a stimulating effect on the whole lighting industry.

PERSONAL

We understand that Mr. F. L. Cator, F.I.E.S., now resident in South Africa, is coming to England for a three months' visit and he is looking forward to meeting old friends again.

It has been brought to our notice that Mr. A. Wyley, member of the Sheffield Centre of the I.E.S., has been awarded the M.B.E. and we offer him our congratulations.

From America we hear that Mr. Samuel G. Hibben has been elected President of the American I.E.S. for the 1951-2 session. We wish him a very successful term of office.

Lighting at the Royal Mint

The following article is concerned with the lighting installed at the Royal Mint in relation to the processes of coining.

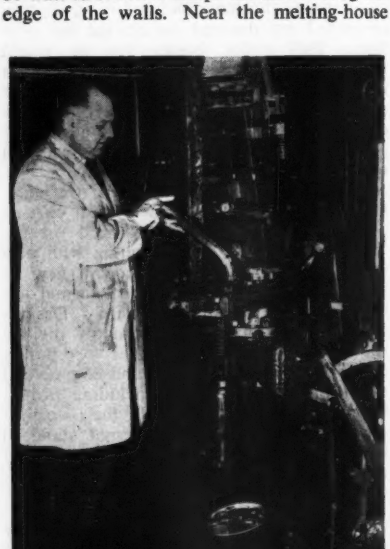
Most of the tungsten lighting formerly installed at the Royal Mint has now been replaced by fluorescent lamps. The visual tasks involved—especially where jobs such as sorting and inspecting the coins are concerned—require very efficient lighting conditions, and the problems confronting the lighting engineer responsible were not always easy.

The administration block was built in the early nineteenth century, and the interior was recently relighted. In the hall, the lighting is diffused so as not to detract attention from the Georgian architectural features, which include some very fine columns. Above these pillars and over the doorways "natural" coloured fluorescent lamps have been installed in cornices. These provide good general illumination, obviate the need for out-of-character ceiling fittings, and enhance the general appearance of the room.

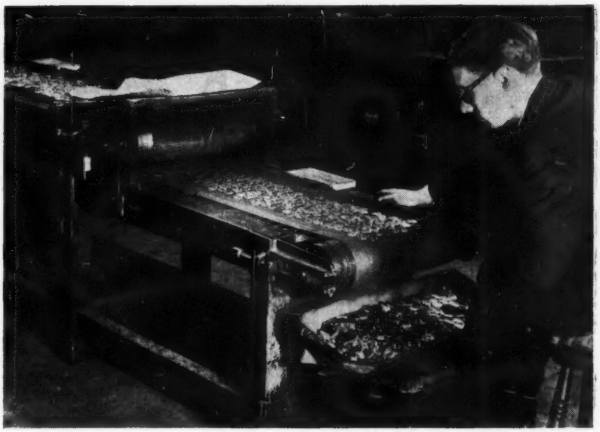
In this part of the building as well as the administration and reception offices there is the museum, where many historical coins are displayed. The lighting of the exhibition cases presented a distinct problem. Not only were reflections to be avoided but the coins, which are mounted on pads, were to be shown in relief. The answer was eventually found by fitting two 60-watt tubular lamps on both sides of the interior of each case; the result is very satisfactory. The general lighting of this room is concealed; reflectors housing 5-ft. 80-watt "daylight" lamps have been fitted in five places in the tops of wall-cases. Except for a wall bracket of Georgian design, which acts as a police light, there are no visible lighting fittings.

In the maintenance shop, where machines are kept in good repair, the area is lofty; there is a gallery around the workshop and a skylight over the centre. The difficulty was to concentrate the artificial lighting over the centre of the workshop where the required level of illumination was 17 lm/ft^2. Fourteen 5-ft. "daylight" lamps mounted at 27 ft. provide the general illumination, while local lighting is by angle units attached to the machines where necessary.

The life of a coin begins in the bronze receiving room where the metal is received in bar form, weighed and directed to the melting house. The ceiling is low, and "seagull" fittings housing "daylight" lamps have been fitted. These give a general spread of light suitable for low-ceilinged rooms. In the melting-house the metals are mixed, melted, and cast into bars, which are then rolled to the required size. Here the lighting is by four 1,000-watt tungsten lights and six 80-watt fluorescent lamps mounted along the edge of the walls. Near the melting-house



A coining press in action. The operator is feeding in blanks which are impressed with "head" and "tail" and edge milling in one operation.



Inspecting the finished coins for faults. An industrial reflector housing a "natural" fluorescent lamp is suspended a few feet above the head of the overlooker.

is the bricklayers' workshop, where most of the work entails looking into furnaces. The problem was to provide suitable lighting so that the operator does not work in his own shadow. Nine fluorescent fittings were mounted on to the ceiling, and these give a very satisfactory light and provide a level of illumination of 32 lm/ft^2 and, in the bottom of the furnaces, of 21 lm/ft^2.

High bay lighting with mercury fluorescent discharge lamps and tungsten lamps has been fitted in the rolling mill where the ingots are rolled to the required thickness. In the large rolling mill, the metal is rolled and cut into strips and then put on trolleys and taken to different coining machines depending on the type of metal. Here it was necessary to install lighting which would help the worker to distinguish easily between the various metals so that the correct metals were sent to the appropriate machines. To give a satisfactory colour rendering, especially for bronze, which apparently caused some difficulty in colour recognition, five 400-watt mercury fluorescent discharge lamps and eleven 500-watt tungsten lamps were mounted at a height of 27 ft.

The strips of metal are fed into machines which cut them into "blanks"—the name for a coin which is shaped but not yet engraved. Then the blanks are conveyed to the blanching room, where they are washed in revolving drums containing diluted sulphuric acid. After the blanks have been cleaned they are conveyed to the press room, where they pass through dies which engrave them on both sides and, at the same time, mill the edges. In this room there were twenty-four 200-watt tungsten lamps, but these have now been replaced by twenty-two (eleven each side) 80-watt fluorescent lamps.

The original die cast for the coins is made by the chief engraver, whose job entails engraving in minute detail. Formerly this work was carried out under the light from a tungsten lamp with a filter, but this has been replaced by a special colour matching unit which gives a good imitation of north daylight and proves an excellent light for the job. After engraving, the coins are then collected and put into bags which are taken to the overlooking room, where each coin is examined for faults. Common faults include bad colour of the coin, wrong impression, dents, scratches or a chipped or flaking edge. The coins are placed on a moving belt under the watch of the overlookers, one of whom examines the heads of the coins and the other, as the coins are tipped upside down on to a belt moving in the opposite direction, the reverse. The task of examining the coins in this way is one which could easily tire or strain the eyes. It was therefore most important that the lighting should be efficient and without glare. It was found with tungsten lighting that specular reflection from the coins made working conditions difficult, but fluorescent lighting has proved most suitable. One fitting, housing one "natural" lamp, has been fitted over each belt, as shown in the above illustration.

After the coins have been passed by the examiners, they are counted, weighed and placed in number bags ready to be circulated to the banks.

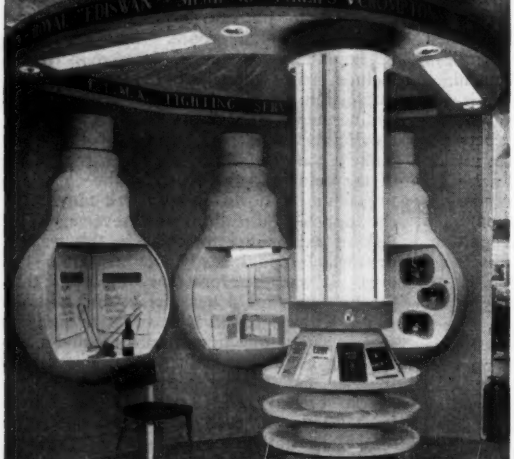
The British Electric Power Convention

A short account of the B.E.P. Convention held at Brighton from June 18-23.

This year the B.E.P. Power Convention, presided over by Sir Henry Self, deputy-chairman of the British Electricity Authority, was held in June, at Brighton. The main lighting interest centred in the exhibition and in the special lighting effects inspired by the convention. The exhibition conformed to tradition in so far as great ingenuity and power of improvisation was used in fitting a full-scale exhibition into a small area. There can be nothing but praise for the work of the exhibition organising staff, and for the high quality of display by the exhibitors.

It is not possible to embark on a description of all lighting features, but the following deserve mention: The saw-toothed ceilings incorporated in the stand shells for concealing the lighting (unfortunately not always fully effective due to faulty placing of the lamps); a general service lamp divided vertically with a pearl and a silica coated half for comparison; a new Class B street-lighting lantern with an opalised end panel for better side lighting; a 125-watt high-pressure mercury lamp, with internally silvered reflector.

The exhibition gave the impression that lighting is holding its own among electrical



The E.L.M.A. Lighting Service Bureau stand at Brighton.

applications; lamps and lighting equipment formed a surprisingly large proportion of the total exhibits. However, there still remains the feeling that the great domestic field for lighting, and particularly fluorescent lighting, is not receiving the attention it deserves. Is it, for instance, unreasonable to hope that a cheap tungsten ballast fitting with 2-ft. or 3-ft. lamps will be produced?

There are signs that materials stringency is affecting the development of new fittings designs. There was little new to be seen in this direction though it must be admitted that stand sizes severely limited the field for displaying fittings. It would appear that many new ideas for fittings have been held up because of material shortages.

Brighton presented, among its other attractions, some excellent outdoor lighting effects of which the specially illuminated Old Steine Fountain was perhaps the highlight. The lighting was, and, we hope, still is, by dimmer controlled, colour changing fluorescent lamps, a novel and competent piece of work which delighted everyone who saw it.

The lighting of the Corn Exchange deserves mention as a direct outcome of the Convention even if not as a Convention feature. With its 12,000 feet of floor space it was an obvious choice for a reception on the scale required by the Convention but a virtually unadorned interior of this size with a ceiling curving over at a height of 35 ft. called for special treatment and the decision to rely on lighting for the necessary transformation was courageous and amply justified in the event.

Five 12-ft. chandeliers were assembled on site out of wooden hoops and strings of pull-out paper balls, each chandelier having at the centre four 4-ft. "Colour Matching" fluorescent lamps. These were hoisted to the full ceiling height and floodlit by clusters of 150-watt internally silvered spotlighting lamps attached to the original pendant drops. Additional general lighting was provided by "Mellow" fluorescent lamps concealed in the existing high-level cornice and decorative lighting provided by laying "Natural" and "Colour Matching" fluorescent lamps on window sills and on the gallery floor in front of lines of plants. In addition provision was made for flood-lighting the chandeliers in colour and for a variety of spot lighting effects.

The importance of the Corn Exchange experiment lies not so much in the lighting methods used, however, but in the decision to use electric lighting as the main decorative medium.

Electric Lamps

(*Continued from page* 273)

manufacturers in many other countries. The life of the fluorescent lamp has been constantly improved by developments in both manufacturing techniques and in the design of electrode systems and circuits. It is probable that the service life of the fluorescent lamp to-day is three or more times the life of the first lamps which were marketed. In this connection it should be emphasised that in considering the life of any electric discharge lamp, either of the pure discharge type or of the fluorescent type, account must be taken of the lumen maintenance of the source. In this way the fluorescent lamp is sharply distinguished from the tungsten filament lamp. In the latter case the life is determined by the operating temperature of the filament, but the life of the fluorescent lamp is more appropriately considered as related to its lumen maintenance and to its particular usage. In other words, the average life of a group of fluorescent lamps must be assessed in relation to the efficiency of the fluorescent lighting system as a whole.

With this in mind, developments have been made to improve the uniformity of fluorescent lamps and their lumen maintenance. The calcium halo-phosphate phospor mentioned above has proved particularly useful in this respect, as it has inherently a higher maintenance than the mixed powders hitherto used. It is probable that in the future development will be along the lines of still further improvements in the maintenance of light output over life and in the development of lamps with improved colour rendition.

British lamps makers have already made major contributions in this field and have progressively introduced new lamps such as the Natural and Mellow types as occasion demanded, and they are playing a major part in international discussions in connection with the specification and measurement of the colour and colour rendering properties of light sources.

In addition to the various standard types of fluorescent lamp of white or near white colours, the range has been recently increased by the introduction of four new fluorescent lamps with relatively saturated colours, namely, blue, green, yellow and red. It is interesting to note in conclusion the way in which these highly coloured yet efficient lamps have been used to produce special display effects in connection with the celebrations of the Festival of Britain.

New Lighting Installations

(Above) Showing the lighting in one of the alcoves at the White Bear Inn.

(Left) General view of the restaurant showing the "portcullis" ceiling.

White Bear Inn

The White Bear Inn, Criterion Building, Piccadilly, has recently been relighted by Courtney, Pope (Electrical) Ltd., in co-operation with Harold Wyatt, Dip. Arch., A.R.I.B.A., M.S.I.A., Designing Architect.

The general lighting of the main restaurant area consists of a wooden "egg-crate" or "portcullis" ceiling, which is suspended some 2 ft. below the structural ceiling. The lighting units, which are let into the louvres, are in two parts. The lower part is an indirect tungsten unit utilising an anodised aluminium reflector bowl, which rests in a "Contralux" panel, "Contralux" being a diffusing material which has been designed and developed for lighting by Courtney, Pope (Electrical) Ltd., in conjunction with Plyglass, Ltd. The lighting above the louvre consists of a square of cold cathode tubing, which is placed in the recess directly above the tungsten fitting. The result is most effective.

R.M.S. Oronsay

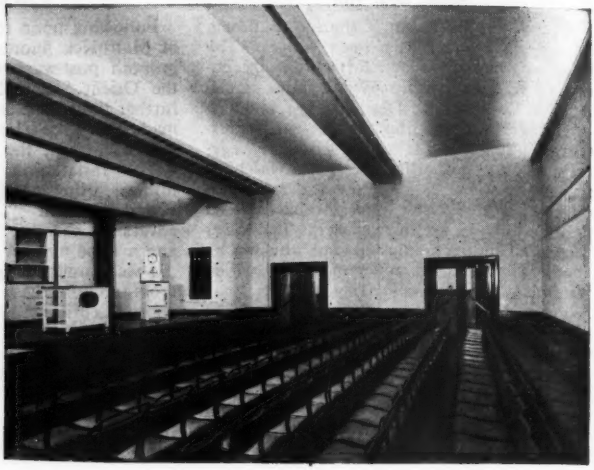
Following upon the successful installation of Metrovick fluorescent lighting equipment in both post-war vessels commissioned for the Orient Steam Navigation Co., Ltd., a further large-scale installation has now been made on the latest addition to their passenger fleet, the R.M.S. Oronsay.

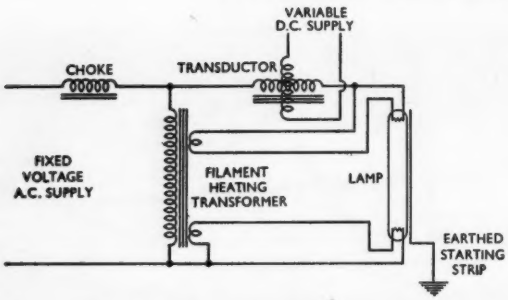
The installation, involving some 1,200 fittings using Metrovick mellow lamps operated from "instant start" circuits, covers all the public rooms, foyers, shops, and a large number of the first-class cabins.

Special units, designed to have a minimum cross section, have been used extensively behind cornices, for soffit and curtain lighting or above dropped ceilings and laylights. These are supplemented, where necessary, by recessed units mounted behind decorative louvres. The resultant effect is to make the lighting an integral part, rather than a feature, of the complete decorative effect.

Fluorescent lighting, using mellow lamps, aboard R.M.S. Oronsay.

Demonstration theatre at new Bristol Electricity Service Centre.





Circuit diagram of dimmer control unit for lamps in demonstration theatre.

Electricity Service Centre

One of the first commercial examples of a dimming installation for hot cathode fluorescent lamps has been brought into use recently in the Demonstration Theatre at the new Bristol premises of the South-Western Electricity Board.

Dimming control is applied to the lamps in four special twin-lamp fittings on the stage, and to one row of lamps in each of the twin rows concealed in cornices running across the auditorium, making a total of 35 hot cathode lamps controlled in this way. The apparatus, designed and supplied by the General Electric Company, Ltd., is similar in principle to the equipment used for dimming hot cathode lamps in the Chamber of the new House of Commons.

Power factor correction is provided centrally by banks of capacitors, so that the dimmer unit associated with each lamp comprises a choke, filament heating transformer and transductor. The transductor is inserted in the circuit in such a position that it effectively impedes the flow of lamp current and yet exerts no undesirable reduction of the open circuit voltage which is necessary for stable operation of the lamp. The function of the fixed choke is to maintain proper filament heating under the various possible lamp conditions. The transformer primary voltage depends on the voltage drop across the choke, which varies according to the lamp current.

The lighting is controlled from a dimmer panel at the side of the stage. Two "Variac" controls are mounted on the panel, one for the stage and the other for the auditorium lamps. Each regulates the voltage applied through a step-down transformer to a rectifier, from which the variable D.C. supply is obtained for the transductors in the dimmer units.

Festival Exhibitions

Of the many exhibitions now open in connection with the Festival of Britain, we are able to comment on only a few of the more important. The following notes cover the Industrial Power Exhibition, the Farm Exhibition, the Land Travelling Exhibition, and H.M.S. Campania.

Industrial Power Exhibition

Although we are all interested in the theme of this exhibition—how British engineering has contributed to civilisation—the main purpose of this note is to observe upon and discuss some of the ways in which lighting has been used in the story.

There are two routes through the exhibition and from the Hall of Power the visitor can choose either the "Water Sequence" or the "Coal Sequence"; in both the theme is the production from natural resources the power upon which industry depends. Both routes, too, lead to the Great Hall in which are presented the stories of shipbuilding and railways. Finally, the climax of the whole presentation is the power source of the future—atomic energy.

With this necessarily brief outline in our minds we can understand more easily how the particular lighting features fit in to the scheme of things.

As in all exhibitions to-day the 150-watt internally-silvered reflector lamps, and the neat enclosures which have become almost inseparable from them, are greatly in evidence; the spots are seldom used for general lighting purposes, but frequently as intended—for the emphasis of special features. The enclosing reflectors often house ordinary pearl lamps.

If we choose to follow the Coal Sequence we are drawn inevitably to a scintillating "sun" some nine feet in diameter; this ball of translucent spun glass is illuminated brilliantly by internally mounted mercury-vapour lamps, with the addition of tungsten lamps so switched as to create an illusion of swirling sun-spots on the surface.

Behind the sun the path through the dim primeval forest is marked out by small fittings with tungsten lamps inset in the floor. At the "Coal Face" in the "Pithead" the lighting is representative of the most modern standards in pits to-day. A feature which probably gave the designers some food for thought is the ceiling treatment necessary to admit light yet at the same time to give an impression of gloom; an egg-box louvre with elements 2-ft. cube has been constructed from black cloth, and although high and unobtrusive gives an impressive effect. In the working demonstrations of this section flameproof fluorescent lamp fittings are naturally in evidence, but the main lighting, for safe circulation, is provided by discreet 5-ft. fluorescent lamps placed longitudinally flush with the ceiling and neatly louvred.

In the steel section which logically follows coal there are no outstanding lighting features immediately apparent but this is in part due to the restrained use of lighting; as an example, the half-scale model of a 230-ton steel ingot is so lighted internally that the "Perspex" used for its construction appears to be glowing white-hot steel. Illuminated transparencies abound, with either tungsten or fluorescent lamps as the illuminators.

A fascinating machine in the workshop, forming part of the Steel section is the flame-cutter; intricate shapes are cut from steel plates by this machine, and no hand guides the cutting flames. A photo-electric head faithfully follows a master profile drawn on paper, and the cutting heads must follow equally faithfully. This is probably the most unobtrusive use of lighting in the exhibition, yet to any engineer it can easily be the most interesting.

The use of colour in the section dealing with steam-raising is a little unusual to the

Showing the gay lighting fittings specially designed for part of the hydro-electricity section at the Industrial Power Exhibition.

lay observer, but no one who is aware of up-to-date practice should be surprised to see a plum-coloured boiler with green economiser, or in the adjacent exhibit a massive oil engine with cream crank-case and pastel shades used in profusion. This particular section is in fact a wonderful piece of propaganda for the work the I.E.S. and its members have been doing to get light colours used more generally in industry —even in the heavier "black" industries. As Mr. J. McCrum, of the Council of Industrial Design, observed during the Press Preview, it is all "right up our street."

We have now reached the hall in which the 187-ton locomotive is shown and in which the 100-ft. long model of a ship's bows dominate the scene. An interesting feature here is a display of prototype railway coaches, with excellent lighting arrangements. On a large expanse of wall lighting fittings are arranged in such a way that they appear as comets streaking across a sky, and in the illuminated "tails" are shown a selection of the various goods carried by our rail services and by our ships.

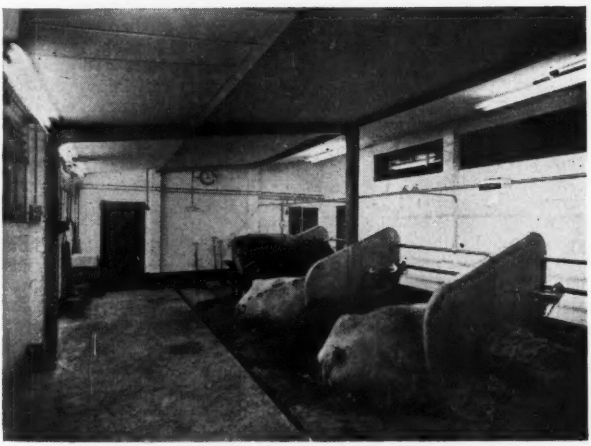
In order to see the other sequence, of water power, we return to the entrance hall and pass under a glass canopy upon which is sprayed a heavy flow of water; the use of spray-proof 150-watt reflector spotlamp fittings is interesting here, but at least one observer doubted their serviceability under the very onerous conditions imposed. The effect is excellent. In the Hall of Hydro-electricity the series of displays and presentations depicting the effect of Hydro-development on the amenities of the Highlands is cunningly lighted from a louvred ceiling! the usual egg-box is unnecessary, as the circulation space does not permit vision from more than one angle, and the louvre is simply constructed from slats about 3 in. apart and slightly angled to allow for the direction of the light on to the displays. A pleasing, even if possibly unintentional, effect is seen in the next hall; a series of reflector spotlamps is used to light the ceiling, and the reflection of these sources seen in the glossy surface forms a consistent and regular pattern. As far as this section luminous ceilings are the rule in the larger display spaces, and thanks to the long hours of daylight at this time of year there has been sufficient natural light from the roof lights of the Kelvin Hall to enable quite

Castlereagh Farm and Farmhouse by night.

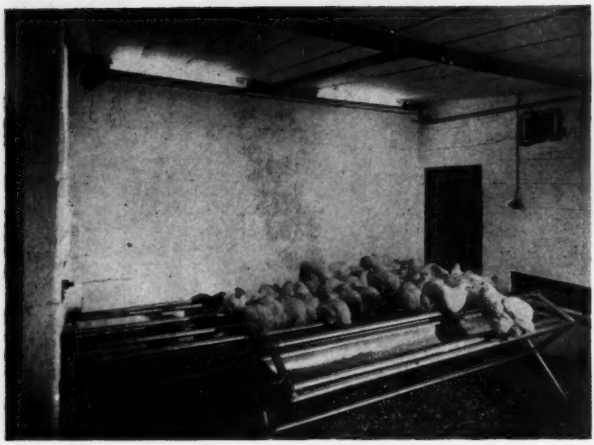
simple artificial lighting to be installed. But when we reach this final demonstration of "Atomic Power" a darkened sky is necessary; star formations are studded over the vaulted ceiling and the 750,000 volt spark creates a remarkably good illusion of lightning flashing between earth and sky. Most conveniently the visitor is now dark-adapted and is consequently able to view the magnificent fluorescent mural under good seeing conditions. This is the last spectacle of the Exhibition, and is a 40-ft. by 12-ft. painting in flourescent pigments; the use of a battery of "black lamps" flooding the mural with long-wave U.V. radiation causes the painting to glow brilliantly, with wonderful effect.

From the lighting aspect there are two points worthy of note in the features; the almost complete absence of the conventional egg-box louvred ceiling, which appears only in two small pieces totalling about 20 sq. ft., and the use of simple fittings in a repetitive pattern. In one concourse alone over 200 six-inch opal ceiling spheres are mounted in exact lines to conform with the architectural shape of the interior.

This is truly an exhibition of outstanding merit, but it possesses any merit in lighting matters more by virtue of the subdued nature of the features than by any particularly garish or extravagant use of light.



Fluorescent lighting in the cowhouse at Castlereagh Farm.



Lighting in the hen-house includes a low intensity roosting light.

Farm Exhibition, Northern Ireland

The all-electric Working Farm and Model Farmhouse, which forms a centrepiece of the Northern Ireland Festival of Britain Exhibition, has many points of interest to lighting men as well as to farmers.

With the increased emphasis on farm electrification, the subject of farm lighting has taken on considerable importance. For this reason particular attention has been paid to the lighting installation, which affords an opportunity for the study of farm lighting, which would not otherwise be easy to find.

The installation is designed to illustrate, among other things, the possibilities of fluorescent lighting on the farm and in the farmhouse in conjunction with tungsten filament lighting, and it is hoped that it will convey to visiting farmers the importance of the lighting design as a whole rather than merely act as an exhibition of lighting equipment.

The exhibition may serve a wider purpose than this, however, in so far as farm lighting development is concerned. Whereas lighting development in other fields has suffered due to the over emphasis on lighting fittings and the absence of authoritative guidance, there is now the opportunity for farm lighting to be developed on well-understood lines from the beginning. It would be a great pity if this opportunity were to be missed and if development were to take place on the old basis of installing lighting fittings as articles of electrical equipment. It is hoped that the Castlereagh Farm will give an impetus to farm lighting development of the better kind.

The electrical and lighting equipment of the farm was organised by the British Electrical Development Association.

Land Travelling Exhibition

This exhibition, although drawing on the subject matter of the London Exhibition at the South Bank, is not altogether a replica and its emphasis is on Industry and Production. It tells the story of the skill of the British people and resources of Britain. It is divided into six sections on the following themes: Materials and Skill; Invention, Discovery and Design; People at Home, Work and Travel.

The lighting interest of the exhibition is to be found in the section on Invention, Discovery and Design. Here a display on lighting is included and coil lamps, fluorescent tubes, stage lighting and sodium discharge lamps are shown. Another feature of lighting interest is in the Dome of Discovery, where there is a colour changing installation. The lighting of the valerium, which is composed of many panels of coloured fabric, is by 'Atlas' colour fluorescent lamps. A control unit enables visitors to determine for themselves how to create colour of any shade or hue from the three primary colours by manipulating the handles of the unit and, at the same time, to study the colour rendering effects of these synthesised hues on the dyed fabrics.

The exhibition is touring the provinces and calling at Manchester, Leeds, Birmingham and Nottingham.

H.M.S. Campania under floodlighting.

H.M.S. Campania

The exhibition aboard this ship, which is visiting many of the English ports up and down the country, tells the same story as the South Bank Exhibition. The task of condensing the story has been extremely well done especially considering the lack of space for, except for the flight deck, the whole of the display is contained in the hangar, which is 300 ft. long.

The first half of the hangar tells the same story as the Upstream Sequence in the South Bank Exhibition, that is, the story of the Land of Britain. Visitors first see displays illustrating the Origins of the British Isles and of the British People. These displays are in the well of the aircraft lift. From here visitors see something of the agricultural use of the land followed by displays on the mineral wealth of the country, particularly coal and iron. The display here includes a mock-up of a coal mine.

This is followed by a section showing the use of these materials in industry with particular emphasis on engineering, plastics, glass and pottery, textiles and wood working. The next series of exhibits tells the story of the development of power. The visitor then sees the story of transport and communications, land, air and sea, illustrated by, among others, a model Underground railway junction made of "Perspex," the cockpit and part of the passenger cabin of a Sealand flying boat and models of the Brabazon and modern aircraft. Other models include Severn Bridge, a modern locomotive and a model of London Airport together with the runway lighting as it will appear when completed.

In the Sea and Shipping section the vital importance of radar as a navigation aid is shown by a radar screen and a complete set of ship's radar equipment, by which the harbour and its activities will be seen. A series of sections on British Discoveries begin with terrestrial discovery and the living world. From this point the rest of the discovery story is displayed on a series of rising galleries. Discoveries in the nature of matter, including atomic research and research into inner and outer space, continue the story.

In the section dealing with the domestic side of British life the problems of living in towns and in contemporary houses are shown and various solutions to the problems of furnishing, etc., are illustrated mainly by five models and a large mural. Contemporary designs in furniture including lighting fittings are exhibited. At night the ship is very effectively floodlit by "Simplex" general purpose and medium range floodlight projectors, as shown in the above illustration.

REVIEWS OF BOOKS

"The Photographic Study of Rapid Events," by W. Deryck Chesterman. Clarendon Press, Oxford, 1951. 21*s. net.* 158 *pp.*, 42 *illustrations*, 32 *plates, and index.*

This monograph is the ninth in the series on the Physics and Chemistry of Materials. The author has had unique opportunities for the study of the subject in his work in the Royal Naval Scientific Service, and the remarkable results obtained under water by him and his colleagues is well known. His book is clear, interesting, and informative.

The book is in two parts, dealing respectively with the techniques used and with the applications. The first part follows the variations in techniques necessary as the repetition rate increases; the first chapter is a general survey, and subsequent chapters discuss intermediate rate cameras, lighting, and photographic materials; then, for higher speed work, follow chapters on single pictures, film drum cameras, and spark and Schlieren photography. Part II outlines applications in many fields, and a fine series of plates completes the volume by illustrating the methods and giving characteristic results.

The covering of so wide a field in a small space involves much compression, and naturally the author has usually to be content to indicate the principles and to use copious references. In some cases he has carried compression to the point of incomprehensibility, as for example in Fig. 6, but the book succeeds nevertheless in presenting a clear picture and in directing the reader who wants detailed information.

A more serious criticism is an error which seems to haunt illumination values quoted throughout in metre-candles, which appear to be low by a factor of about 100. The figures on p. 39, Table VII (p. 40) and on pp. 44 and 46 evidently need correction, as the reader may be seriously misled.

The standard of production and illustration is high and the language is clear and economical. J. M. W.

"How to Write Technical Books," by John Gloag. George Allen and Unwin, Ltd. Price 12*s.* 6*d.* 159 *pp.* 45 *illustrations and* 4 *plates.*

This book is intended as a comprehensive guide to prospective authors on how technical books and papers may be written and presented in an easily assimilated form. To those technicians who "disclose an unfortunate tendency to use cumbersome technicalities instead of plain English," the author emphasises the need for brevity, clarity and simplicity in writing.

Much useful information is given, including advice on the relationship between author and publisher; full details are also given on the preparation of manuscripts, estimation of type space, typography, blocks and illustrations. A useful chapter includes extracts from B.S. "Printers' and Authors' Proof Corrections," as well as a guide to indexing.

The example of Hilaire Belloc, who, when referring to the essentials of a good speech, said that it should be divided into three parts—"You should tell your audience that you are going to tell them something; then tell them; then tell them you've told them"—is equally applicable to writing a book and has been faithfully followed by Mr. Gloag himself. C. P. M.

"The High Pressure Mercury Vapour Discharge," by W. Elenbaas. North Holland Publishing Co., Amsterdam, Holland. f. 14.50. 173 *pp.* 80 *illustrations.*

The properties of the high-pressure mercury vapour discharge are of considerable practical as well as theoretical interest.

Perhaps the earliest lamps exhibiting the specialised phenomena which is treated in the present work were those made by Küch and Retschinsky in 1906. It was, however, the development of the high-pressure mercury vapour discharge as a practical light source some 20 years ago which stimulated theoretical interest in high-pressure discharge phenomena and Dr. Elenbaas is an authority on this subject. His present book not only contains summaries of his own important work in this field, but also takes account of practically everything else that has been published on the subject during the last 20 years or so.

In the experimental sections the techniques which have been used for the determination of such variables as the influence of the nature and concentration of the starting gas, the temperature of the mercury vapour and other factors affecting the discharge are most elegant.

The book contains a great deal of valuable data on various experimental high-pressure mercury vapour discharges, and it is worthy of note that while the treatment is primarily related to metallic vapour discharges it has wider applications to other high-pressure discharge lamps such as those containing the rare gases.

It should be emphasised that the treatment of the subject is somewhat specialised and the book will therefore appeal more

to the theoretical physicist and those engaged in the study of high-pressure discharge phenomena and high-pressure lamp developments rather than to the general reader. It should be in the possession of all those interested in electric discharge phenomena, and will prove stimulating to workers engaged in the design of high-pressure gaseous and metallic vapour lamps. It is a well-produced volume, with clear and simple illustrations. J. N. A.

Correspondence

"Luminescence"

To the Editor, LIGHT AND LIGHTING.

Dear Sir,—I must confess I was surprised when listening to Prof. Andrade's amusing discourse on luminescence to hear him repeat the ancient fallacy that the firefly is an efficient producer of light. Your contributor "Lumeritas" also appears to believe it.

The claim rests purely on the fact that the light emitted by the firefly has a fairly narrow emission spectrum falling very close to the region of maximum sensitivity of the human eye. As a result astonishingly high lumens per watt are quoted, but it is seldom stated that the watts in this case are watts radiated. The true efficiency of most chemi-luminescent reactions is very low. In most cases several thousand molecules undergo oxidation for every one that emits light in the process, and the complex reactions that occur in living organisms are no exception to this.

One further point is that the coincidence between the emission spectrum of the firefly and the sensitivity of the human eye is probably fortuitous. The firefly glows to attract its mate. As far as I know the spectral sensitivity of the eye of the firefly has not been measured, but it is unlikely to be the same as ours. Bees, for example, can see well in the near ultra-violet. It seems, therefore, that even in his own world the firefly may not be the brightest of possible luminaries, while the achievements of the human lamp manufacturer are not entirely despicable.—Yours, etc.,

C. G. A. HILL.

London.

Lighting for Agriculture

To the Editor, LIGHT AND LIGHTING.

Sir,—Recently I had the privilege of attending the 1951 agricultural show of the Bath and West and Southern Counties Society, held at Dorchester.

The general impression I gained from the various trade stands was that there is nowadays a wealth of electrically and mechanically operated labour-saving devices for use both in farming and in the farm-house.

I looked in vain, however, for evidence of the latest developments in lighting as an aid to the improvement in the working conditions and cleanliness of farm buildings. Perhaps the importance of adequate lighting in agriculture is of little consequence compared to the other aspects of farming.

Perusal of the I.E.S. Code for the Lighting of Building Interiors does not help to throw any light on this subject. What are, for instance, the recommended values of illumination for a cow or dairy house, a food store and mixing room, a granary, etc.?

In Post-war Building Studies No. 11, "Electrical Installations," a section dealt with the applications of electricity in farm buildings. Here was suggested the post-war development of the modernisation and reconstruction of existing farms, with special regard to farm electrification. Have any of these suggestions been put into effect?

You have had a splendid series of articles on the development of school lighting in recent issues of LIGHT AND LIGHTING. May I humbly suggest an article or two on the lighting problem in agriculture by inviting some of our talented lighting specialists to impart their knowledge and experience on this subject?—Yours, etc.,

H. M. BEAVEN.

Dorchester, Dorset.

POSTSCRIPT

By "Lumeritas"

It is an ill light that brings no one any good, but the particular benefit certain lights have brought to a barrister of the Inner Temple is unusual. He has had a present from the Ministry of Works of 10 pairs of curtains, costing more than £100, to make his flat in Temple Gardens blind to the Festival floodlights on the Inner and Middle Temple lawns. Apparently seven or eight floodlights are trained on the building containing his flat, and an unwelcome amount of light entered his sitting-room, study, and bedroom before the new curtains were fitted. In his bedroom, "the glare was so strong," he said, "that I could sit up and read by the light reflected off the ceiling," and as his flat was not overlooked—except by pigeons—he had only provided thin curtains which were drawn when the moon shone. Here is a case of an occupier asserting rights of "ancient darkness," not of "ancient lights." The circumstances are unusual, and if any of my readers think of claiming a set of heavy curtains from the local authority responsible for siting a street lamp in front of their bedroom windows I doubt if their claim will succeed on the precedent of the barrister's case!

So dominant is vision in our daily lives that, as nearly everyone knows, we frequently use words which are properly descriptive of visual experience when expressing ourselves about non-visual matters. "What a *dull* fellow he is" doesn't mean "he" really *looks* dull, despite the fact that if pressed to say why "he" is a dull fellow many of us might say, "Well, he *looks dull*" or "Well, he doesn't *look very bright*, does he?" "I see" is a colloquialism most of us use every day to indicate that we have understood some explanation received aurally! But occasionally the language of hearing is used to describe a phenomenon (itself a visual word) which is seen and not heard. I was reminded of this recently while watching a demonstration of types of interference (e.g., "snow-storms" and regular patterns) on television screens—these unwanted sights being technically called "noise." This is not surprising considering that the language of hearing is naturally employed in the vocabulary of telephony, and that "telephany" (popularly, but less aptly, termed "television") has been developed technically to a large extent by engineers having a radio-telephony background.

The adoption of cheering colour schemes in decorating factory interiors appears to be growing apace. As the result of "pilot" experiments, numerous industrialists have been convinced that it is worth while to create a pleasing visible environment for workers by suitable colour schemes. I have recently heard of one firm operating several large factories who have decided on a programme of repainting which will involve an expenditure not far short of £100,000, and which will require several years for its completion. It is gratifying to note this liberal regard for visual amenity.

The users' reactions to lighting innovations are always of interest to designers whose *raison d'etré* is to meet user requirements. For this reason I have culled the following letter from the correspondence columns of "The Motor."

"During the past months I have noticed that new lighting units have been installed on street refuges between the two 'Keep Left' guard posts and after making inquiries I have discovered that this pattern is to be standardised in all districts. As a motorist of considerable experience in all parts of Britain and many places abroad I am of the opinion that a more dangerous street lamp could not have been found for the purpose of lighting street refuges. The extreme height, I understand, is to show oncoming drivers a light above tall vehicles and thereby warn the position of a refuge below, but in reality these lamps are so small and dim that they are rarely seen at all. The complete absence of light on the refuge itself makes it impossible for the motorist to see whether a pedestrian may be about to proceed into the carriageway and causes much more unnecessary strain on the night driver. Now Hendon and Hornsey have been busy replacing their old-type lamps (which were fairly good) with these new ineffective standards, and it remains a mystery to my motorist friends and myself why these change-overs are allowed to go on."